

SUBJECT: Announcement of Public Review and Comment Period

PUBLIC REVIEW PERIOD: Commences immediately (October 31, 2002) and ends December 6, 2002.

DOCUMENTS SUBJECT TO THIS ANNOUNCEMENT:

1. Draft Environmental Assessment: Rehab Visitor Center and Fee Collection Facilities, Mammoth Cave National Park, Kentucky

ADDRESSES FOR COMMENTS:

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Mammoth Cave National Park proposes to renovate its existing visitor service and fee collection facilities located at park headquarters. The existing facilities were completed in 1963, and are in need of renovation because of age and more importantly because they are not functionally adequate for the current and future level of visitation.

The proposed project is intended to correct many deficiencies of the current facility. The deficiencies include severe seasonal overcrowding and the resultant circulation problems, tour bus circulation, restroom accessibility issues, plumbing fixture count, much needed mechanical system upgrades, lack of exhibit space and exhibits, thermal envelope inefficiencies, overall energy efficiency, and general maintenance of the facility. Operational efficiency is also addressed to improve the functional aspects of visitor circulation, safety, and security.

The current visitor center, cave tour ticketing, and administration facility was built in the early 1960's to serve up to 1,500 visitors daily during the peak (Summer) season.

Annual park visitation was more than four times greater in 2000 than in the early 1960's. One of the impacts of increased visitation was removal of most exhibits by the mid-1970's to provide the additional space needed for visitor information and ticket sales functions.

Park visitation grew rapidly beginning in the mid-1950's. There were significant increases in visitation during the late 1960's and early 1970's, which were likely influenced by the construction and completion of Interstate Highway 65 during that time. Before 1970, the inadequacy of the existing facilities had been recognized, and the Denver Service Center produced a Master Plan that called for replacement of the park visitor center with a new larger facility at a different location within the park. For a variety of reasons, construction of the larger visitor center designed to accommodate the increasing visitation was not funded. In 1983, the General Management Plan (GMP) replaced the Master Plan. The GMP included retention of the existing facilities with no change in location. Park visitors and park staff have struggled with inadequate facilities for over thirty years since the need for improvement was first identified. The advent of the Recreation Fee Demonstration program provided another opportunity to provide much needed improvements in visitor facilities.

This Environmental Assessment describes the alternatives, the affected environment, and the environmental consequences of each alternative (including the direct, indirect, and cumulative effects of each alternative) and identifies an environmentally preferred alternative.

This Environmental Assessment is intended to facilitate compliance with the National Environmental Policy Act and various other related administrative and legislative requirements.

This document is available for public review until December 6, 2002. Your comments are welcome, and they will receive thoughtful study. This document will be finalized only after your comments have been considered.

If you have questions, please contact Management Assistant Henry Holman at 270-758-2254.

DRAFT ENVIRONMENTAL ASSESSMENT

**Rehabilitate Visitor Service and Fee Collection Facilities
Line-Item Construction Package 171
Project Management Information System (PMIS) Number 734
and
Closely Associated Projects
Phase I Exhibits – PMIS 36348
Phase II Exhibits – PMIS 67579
Mammoth Cave National Park, Kentucky**

PURPOSE AND NEED

Mammoth Cave National Park proposes to renovate its existing visitor service and fee collection facilities located at park headquarters. The existing facilities were completed in 1963, and are in need of renovation because of age and more importantly because they are not functionally adequate for the current and future level of visitation.

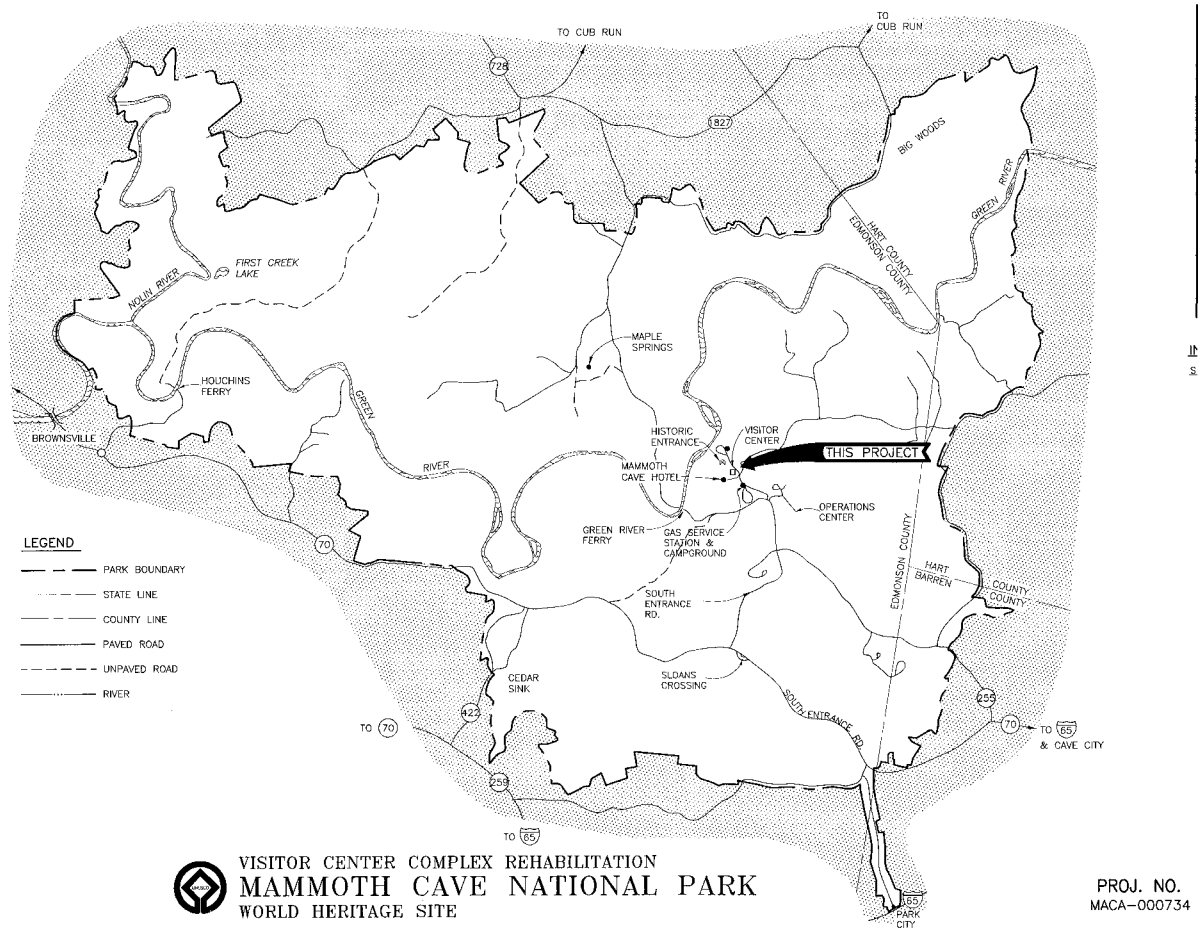
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of the park visitor center with a new larger facility at a different location within the park. For a variety of reasons, construction of the larger visitor center designed to accommodate the increasing visitation was not funded. In 1983, the General Management Plan (GMP) replaced the Master Plan. The GMP included retention of the existing facilities with no change in location. Park visitors and park staff have struggled with inadequate facilities for over thirty years since the need for improvement was first identified. The advent of the Recreation Fee Demonstration program provided another opportunity to provide much needed improvements in visitor facilities.

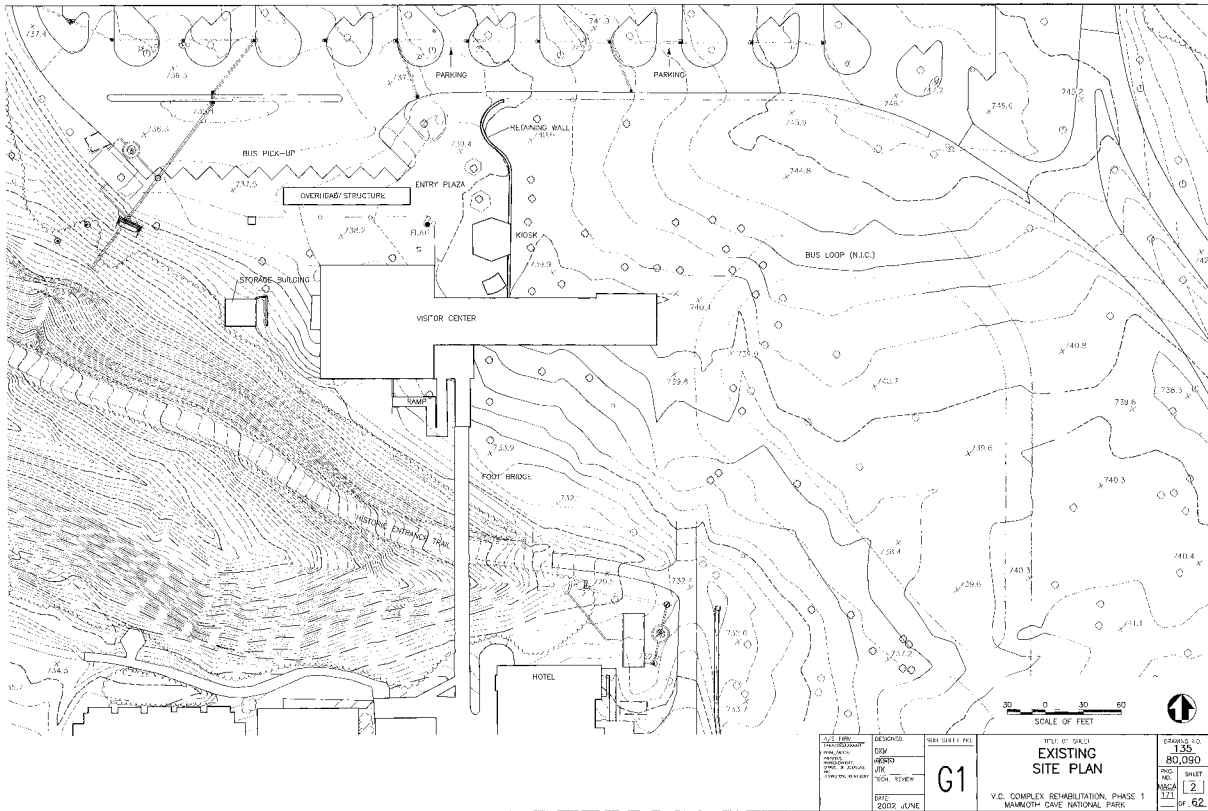


There are three basic problems with the existing facilities that should be remedied. First, there is inadequate space for the basic functions (i.e., restrooms, ticket sales, audio-visual programs, events, exhibits, and cooperating association sales), and the available space is poorly configured so that visitors experience unnecessary congestion. Second, there are inherent health and safety problems including sick building syndrome and inappropriate mixing of traffic and pedestrians. Third, the buildings are aging and overdue for a major rehabilitation and mechanical systems upgrade. Energy efficiency would be included in the design of each system.

The renovation would be accomplished in two phases to provide for continued cave tour operations during the construction period. The proposal also includes two exhibit projects and the relocation of park offices to vacant houses. The projects are detailed in project statements

submitted in the National Park Service Project Management Information System. Recreation fees collected at the park, as part of the Recreation Fee program would fund most of the work.

This Environmental Assessment is intended to facilitate compliance with the National Environmental Policy Act and various other related administrative and legislative requirements.



Existing Site Plan

BACKGROUND

MAMMOTH CAVE NATIONAL PARK LEGISLATIVE HISTORY

The mission of Mammoth Cave National Park is established by specific enabling legislation.¹ It includes the text of the legislative acts as well as related reports and speeches that were prepared in support of the legislation. Following is a selection of excerpts from the legislative record that specifically relate to resource values.

Your commission has also made a careful examination of the Mammoth Cave region of Kentucky and believes sufficient reasons exist to warrant its acceptance as a national park if requirements are met as outlined in this report. Below are briefly outlined some of these reasons. Mammoth Cave is the best known and probably the largest of a remarkable group of limestone caverns, 20 or more of which have been opened up and explored to a greater or less extent. ... There is good evidence that many more caverns yet to be discovered exist in this immediate territory, and it seems likely that most, if not all, of this entire group of caverns eventually will be found to be connected by passageways forming a great underground labyrinth of remarkable geological and recreational interest, perhaps unparalleled elsewhere. ... The Mammoth Cave area is situated in one of the most rugged portions of the great Mississippi Valley and contains areas of apparently original forests, which, through comparatively small in extent, are of prime value from an ecological and scientific standpoint and should be preserved for all time in their virgin state for study and enjoyment. Much of the proposed area is now clothed in forest, through which flows the beautiful and navigable Green River and its branch, the Nolin River. All this offers exceptional opportunity for developing a great national recreation park of outstanding service in the very heart of our Nation's densest population and at a time when the need is increasingly urgent and most inadequately provided for.²

The connection between the report of the Southern Appalachian National Park Commission, the purpose of the proposed park, and the legislation that established Mammoth Cave National Park is clear in the speech by Congressman Thatcher, when he said,

The bill now under consideration (H.R. 12020) is drafted in strict accordance with the recommendations of the aforesaid commission.³ ...

The area called for in the bill will insure a great recreational ground, most advantageously located, where, in spring, summer, and fall thousands of our people may find—in addition to the pleasure and interest derived from an inspection of the caves and their many features of interest—the most delightful outdoor recreation in boating and fishing on Green and Nolin Rivers, lovely, navigable streams flowing for miles through the proposed park, and in traversing the picturesque and rugged hills and valleys and great forests of the region included in the proposed park area.⁴

¹ 16 U.S.C. 404-404f.

² United States Department of the Interior, Final Report of the Southern Appalachian National park Commission to the Secretary of the Interior, June 30, 1931 (GPO: Washington D.C., 1931) 18.

³ Mammoth Cave National Park, Speech of Hon. Maurice H. Thatcher in the House of Representatives, March 5, 1930 (GPO: Washington, D.C., 1930) 8.

⁴ Speech of Hon. Maurice H. Thatcher, 11. The same language appears in the Senate, Committee on Public Lands and Surveys, Report No. 823, May 10, 1926, and the House of Representatives, Committee on the Public Lands, Report No. 1178, May 12, 1926.

MISSION STATEMENTS

The following mission statements were created as broad statements of the mission requirements established by Congress in the Acts that created the National Park Service and Mammoth Cave National Park.

National Park Service Mission

The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration, of this and future generations. The Service cooperates with partners to extend the benefits of natural and cultural resources conservation and outdoor recreation throughout this country and the world.⁵

Mammoth Cave National Park Mission

The mission of Mammoth Cave National Park is to protect and preserve for the future the extensive limestone caverns and associated karst topography, scenic riverways, original forests, and other biological resources, evidence of past and contemporary lifeways; to provide for public education and enrichment through scientific study; and to provide for development and sustainable use of recreation resources and opportunities.⁶

MANAGEMENT OBJECTIVES IN THE GENERAL MANAGEMENT PLAN RELATED TO THIS PROJECT

To ensure that park development is adequate for efficient park administration and essential visitor services, consistent with the park's purpose, Service policies and other park objectives, and compatible with the special requirements imposed by the cave environment.

To minimize impacts on fragile natural resources by locating facilities in areas that are able to support such use without sustaining unacceptable environmental damage.

To ensure that all park developments operate efficiently and that those not economical to rehabilitate are eliminated.⁷

STRATEGIC PLAN MISSION GOALS RELATED TO THIS PROJECT

Long-Term Goal IIa.

Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.⁸

⁵ United States Department of the Interior, National Park Service, GPRA on the GO: Government Performance and Results Act (GPRA) & Performance Management, Version 2.2, May 1998.

⁶ Mammoth Cave National Park, Strategic Plan, 3.

⁷ United States Department of the Interior, National Park Service, Denver Service Center. General Management Plan: Mammoth Cave National Park. Denver, October 1983, 5.

⁸ Strategic Plan, 11.

Long-Term Goal IIb.

Through interpretive programs, education programs, and publications the value of Mammoth Cave National Park's cultural and natural resources will be conveyed to park constituents in the context of World Heritage and Biosphere Reserve status.⁹

EXCERPTS FROM NATIONAL PARK SERVICE MANAGEMENT POLICIES, 2001

The National Park Service will provide visitor and administrative facilities that are necessary, appropriate, and consistent with the conservation of park resources and values. Facilities will be harmonious with park resources, compatible with natural processes, esthetically pleasing, functional, energy- and water-efficient, cost effective, universally designed, and as welcoming as possible to all segments of the population. Park facilities and operations will demonstrate environmental leadership by incorporating sustainable practices to the maximum extent practicable in planning, design, siting, construction, and maintenance. (p. 99)

9.1.1.7 Sustainable Energy Design

Any facility development, whether it be a new building, a renovation, or an adaptive re-use of an existing facility, should include improvements in energy efficiency and reduction in "greenhouse gas" emissions for both the building envelope and the mechanical systems that support the facility. Maximum energy efficiency should be achieved using solar thermal and photovoltaic applications, appropriate insulation and glazing strategies, energy-efficient lighting and appliances, and renewable energy technologies. Energy-efficient construction projects should be used as an educational opportunity for the visiting public.

9.1.2 Accessibility for Persons with Disabilities

The NPS will design, construct, and operate all buildings and facilities so they are accessible to, and usable by, persons with disabilities to the greatest extent reasonable, in compliance with all applicable laws, regulations, and standards. This means that all new and altered buildings and facilities will be in conformance with appropriate design standards. It also means that a sufficient number of existing buildings and facilities will be modified to ensure that programs can be provided in an accessible location. Accessibility will be provided consistent with preserving park resources, visitor safety, and providing a high-quality visitor experience.

9.1.3 Construction

The Service will incorporate sustainable principles and practices into design, siting, construction, building materials, utility systems, recycling of all unusable materials, and waste management. Best management practices will be used for all phases of construction activity, including pre-construction, actual construction, and post-construction.

9.1.3.1 Construction Sites

Construction sites will be limited to the smallest feasible area. The selection of construction sites will consider opportunities for taking advantage of natural sources of lighting, heating, and cooling (e.g., near an existing or potential stand of deciduous trees)

⁹ Strategic Plan, 12.

in order to maximize energy conservation. Ground disturbance and site management will be carefully controlled to prevent undue damage to vegetation, soils, and archeological resources, and to minimize air, water, soil, and noise pollution. Protective fencing and barricades will be provided for safety, and to preserve natural and cultural resources. Effective storm water management measures specific to the site will be implemented, and appropriate erosion and sedimentation control measures will be in place at all times. Solid, volatile, and hazardous wastes will be stockpiled, transported, and disposed of, as appropriate, and in compliance with federal, state, and local laws and regulations. All materials will be recycled whenever possible.

9.3 Visitor Facilities

While striving for excellence in visitor services, the NPS will limit visitor facility development to that which is necessary and appropriate. Facilities like gas stations and grocery stores may be necessary to park use and enjoyment, but it does not necessarily follow that these facilities must be located inside a park. The NPS will encourage the development of private-sector visitor services in gateway communities to contribute to local economic development, encourage competition, increase choices for visitors, and minimize the need for in-park facilities. When visitor facilities are found to be necessary and appropriate within a park, they will be designed, built, and maintained in accordance with accepted NPS standards for quality, and the NPS commitment to visitor satisfaction.

9.3.1 Informational and Interpretive Facilities

Informational and interpretive facilities will be provided to assist park visitors in appreciating and enjoying the park and understanding its significance, provided that the facilities can be developed without impairing the park's natural or cultural resources. The Harpers Ferry Center will be consulted on planning, design, and quality control for major interpretive facilities.

9.3.1.3 Visitor Centers

When necessary to provide visitor information and interpretive services, visitor centers may be constructed at locations identified in approved plans. To minimize visual intrusions and impacts to major park features, visitor centers will generally not be located near such features. Where an in-park location would create unacceptable environmental impacts, authorization should be obtained to place a visitor center outside the park. Visitor centers are not substitutes for personal or self-guiding on-site interpretation. They will be constructed only when it has been determined that indoor media are the most effective means of communicating major elements of the park story, and that a central public-contact point is needed. As appropriate, a visitor center may include information services, sales of educational materials and theme-related items, audiovisual programs, museums, museum collections storage, exhibits, and other staffed or self-help programs and spaces necessary for a high-quality visitor experience. Additionally, the need for restrooms, drinking fountains, and other basic visitor requirements will be considered during the planning and design stage.

ALTERNATIVES

This environmental assessment analyses two action alternatives and a “no action” alternative. A design charrette and evaluation was performed for this project in September, 1998 by park staff and design professionals from the Denver Service Center. The “Design Charrette Document” that resulted from this effort served as the basis for a value analysis study that was completed in November 1999. Other alternatives involving new construction at other locations were considered during the planning process but were dropped from further consideration. The General Management Plan for the park (October 1983) specifies that the location of facilities will not be changed. They were also dropped because of the greater environmental impacts associated with development of a new site and the need to retain and reconstruct some facilities at the existing site. Additional costs include reconstruction of utilities and visitor access roads to accommodate a different location. The alternative of new construction at the existing site was also dismissed from further consideration because of its greater cost.

The October 1999 value analysis identified two viable alternatives in addition to a no action alternative.

Alternative 1: RENOVATION (no increase in the square footage, i.e., the design concept from the 1998 charrette)

Alternative 2: RENOVATION PLUS (Rehab with additional square footage)

Both alternatives contain some common elements. Each requires administrative functions to be moved to another location to make room for improvements. Vacant houses in the park residential area will be used for office space. Each alternative includes stand-alone phases to enable continuation of visitor services during construction. Each alternative includes basic wayfinding signage and provision of exhibit space. The exhibits (for programming purposes) are contained in two separate projects. Nevertheless, they are essential elements of rehabilitation of the visitor center and therefore are included in this environmental assessment.

To be considered viable, a proposed alternative would meet the following minimum requirements, which were established during the value analysis process. A viable alternative would:

1. be within the existing disturbed site;
2. minimize cost in order to fit within anticipated fee revenues;
3. have stand-alone phases;
4. provide needed improvements in Phase I even if Phase II were not funded;
5. provide for continued operation of cave tours during construction;
6. minimize the need to adapt other facilities for the site to function; and
7. remedy the short-comings of the existing facility.

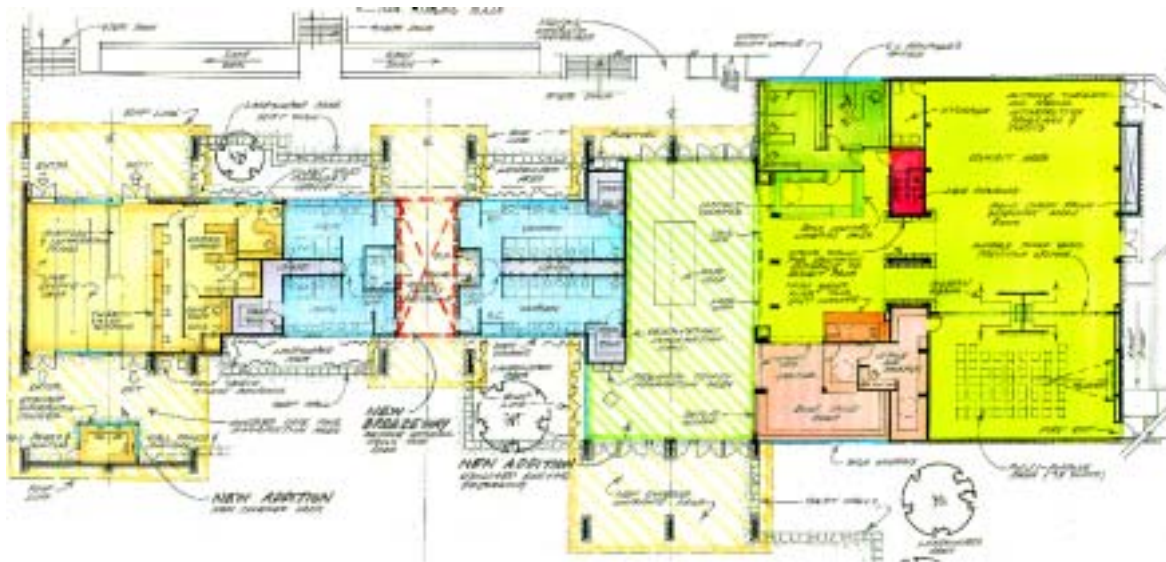
SELECTION OF THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

Alternative 2 has been identified as the environmentally preferred alternative because: compared to Alternative 1 it provides a more energy efficient envelope. Construction impacts would essentially be the same for either alternative. The value analysis completed for the project also identified Alternative 2 as the most cost effective alternative, i.e., Alternative 2 would provide greater benefits with a lower life cycle cost.

The results of the value analysis were presented to the National Park Service Development Advisory Board in December 1999. Based on the favorable recommendation from the Development Advisory Board the National Park Service Director approved the project in February 2000. It was submitted for congressional review and was cleared to proceed at the end of September 2000. The design is expected to be complete near the end of 2002 with construction to start in 2003. It is anticipated that sufficient fee revenues will have been accumulated by the end of fiscal year 2003 to fully fund construction of Phase I. Phase II construction is expected to be funded and begin in 2005 or 2006.

ALTERNATIVE 1: RENOVATION

This alternative is the basic renovation plan that resulted from the 1998-design charrette. It proposed two phases of construction. Phase I would renovate the existing administrative space (east building) into new space for ticket sales and restrooms. It would replace existing tour staging areas with a new space designed for that purpose. The use of outdoor space would be maximized to improve visitor movement through the site. Phase I exhibits would be focused on providing wayfinding information, site orientation, and cave tour orientation. Phase II would add an expanded and covered breezeway between the east and west buildings, which would function as an expanded lobby. Phase II would also renovate the interior of the existing visitor center into exhibit and audio-visual program space, offices, cooperating association sales, backcountry permitting station, and staff library and work space. Following renovation of the west building, the Phase II exhibits would be installed.

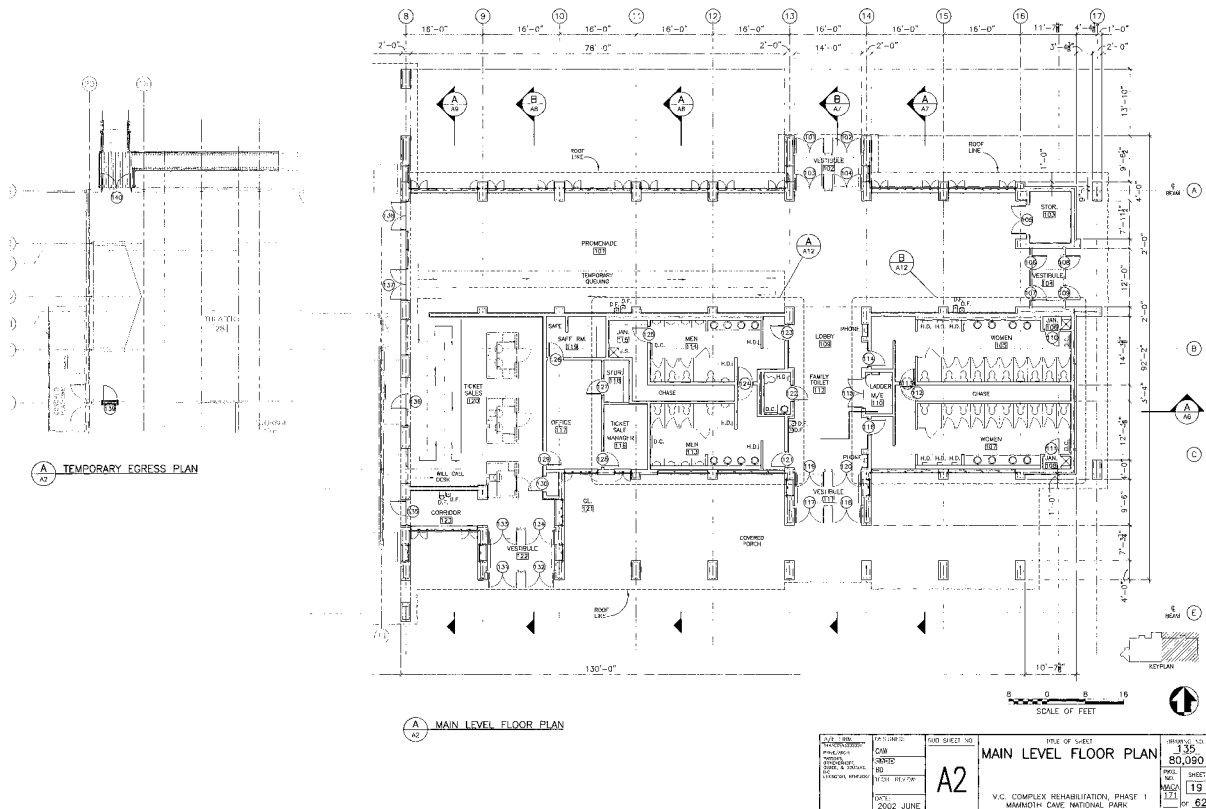


Schematic of Alternative 1: RENOVATION

The additional space for expanded restrooms, a new ticket sales area, and exhibit areas would be gained by moving administrative offices to unused houses in the park residential area. The strength of the renovation concept is that it provides the desired improvements in the function of the building and the site. However, it has a weakness because visitor movement between the functional areas is outside the building envelope, which would be expected to add greatly to the cost to heat and air condition the indoor spaces.

ALTERNATIVE 2: RENOVATION PLUS (ENVIRONMENTALLY PREFERRED ALTERNATIVE)

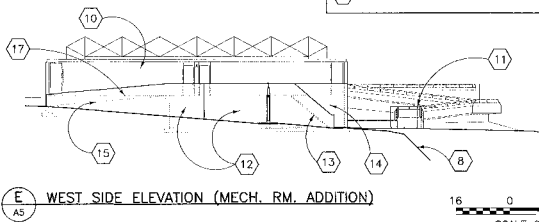
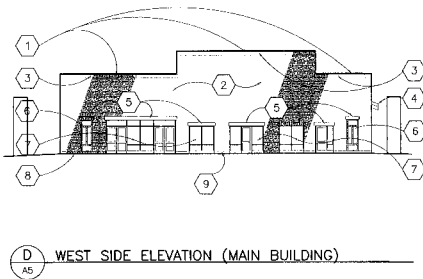
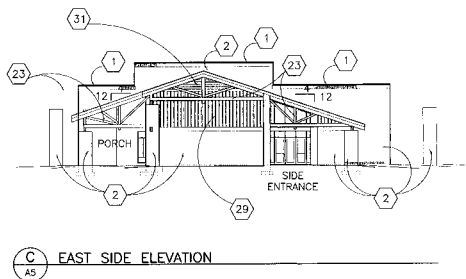
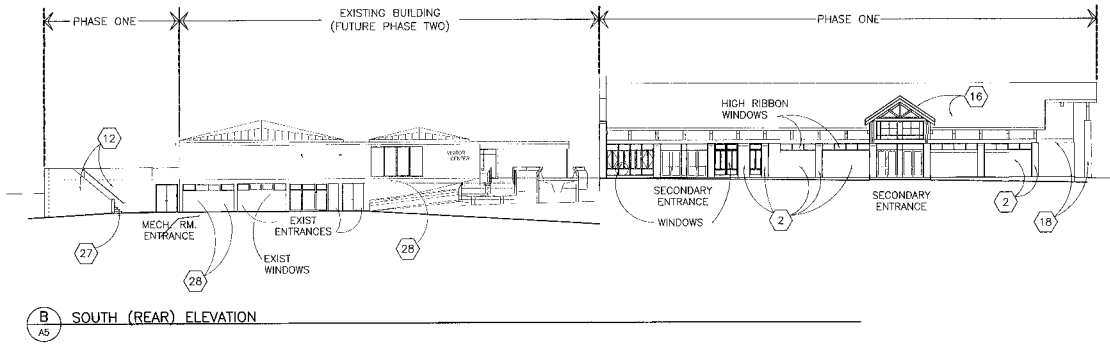
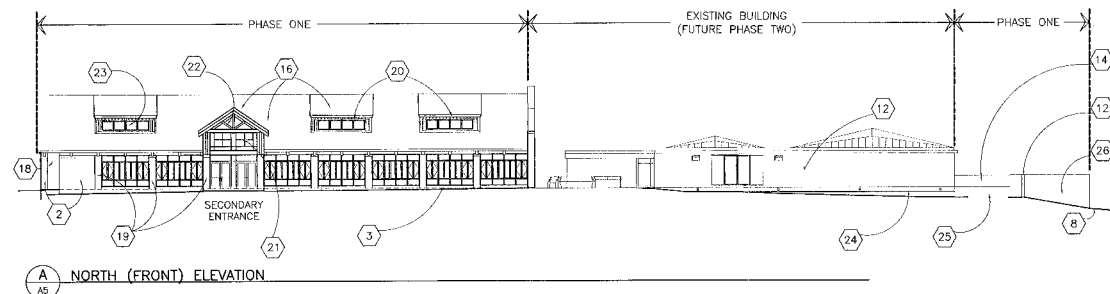
Alternative 2 evolved during the value analysis study. It combines strengths found in alternative 1 with strong points associated with new construction and minimizes the weaknesses. Consequently, it is the environmentally preferred alternative. Alternative 1 had a weakness in that it did not provide a very energy efficient building envelope, meaning that it would not comply with National Park Service Management Policies 2001, Section 9.1.1.7 (see page 6). It made extensive use of outdoor space for circulation around the site but, therefore, increased the number of openings in the structure.



Alternative 2: Phase I Floor Plan

Alternative 2 retains much of the linear traffic pattern relative to cave tours (i.e., visitors follow a direct line from parking through information, to ticketing, to the tour departure staging area). Alternative 2 provides advantages for energy efficiency by adding an enclosed gallery on the north side of the east building (shown above) that provides for circulation around the site to take place within conditioned space and still effectively utilizes the outdoor spaces.

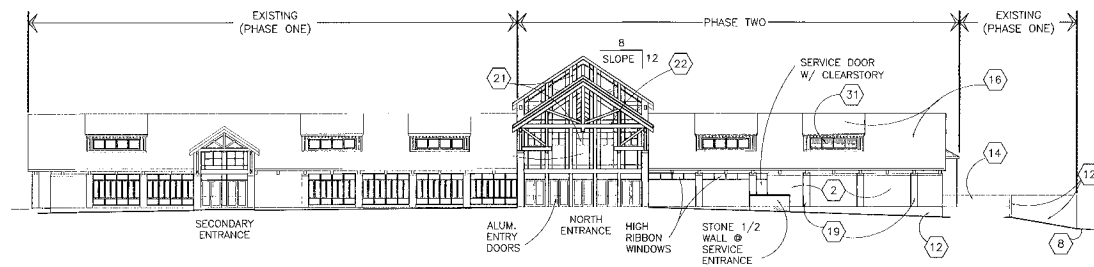
Following approval by the National Park Service Director and review by the Congress, more detailed designs and drawings were developed. Selected schematics from the most recent design drawings are included in the following pages.



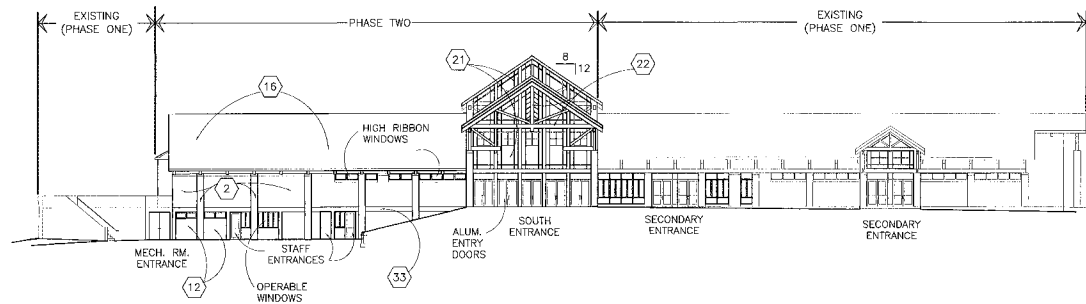
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SCALE OF FEET

NOTES	
1	REFER TO SHEET XX FOR WINDOW ELEVATIONS & DETAILS
KEYNOTES	
1	PRE-FIN PARAPET CAP FLASHING
2	MFR. STONE
3	12" MFR. STONE SOLDIER COURSE
4	ROOF LINE (BEYOND)
5	12" TALL MFR. STONE SOLDIER COURSE @ LITTLE BM
6	ALUM. CLAD WD WINDOW ASSY.
7	PRE-FIN ALUM STOREFRONT ASSY.
8	FIN GRADE
9	8" MFR. STONE SOLDIER BASE CONT.
10	EXISTING BUILDING (BEYOND)
11	EXIST. CONCRETE RAMP (BEYOND) TO REMAIN
12	CONCRETE WALL
13	STAIRS (BEYOND)
14	CONCRETE WALL (BEYOND)
15	FIN. GRADE @ EXIST WAY (SHOWN DASHED)
16	ASPHALT SHINGLES
17	TOP OF EXIST SLAB (SHOWN DASHED)
18	STONE BEYOND
19	STONE PIER
20	SHED DORMER W/BOARD & BATTON SIDING
21	GLAZING (BEYOND)
22	HEAVY TIMBER FRAMING
23	OPERABLE AWNING WINDOWS
24	EXISTING CONCRETE FOUNDATION
25	RAMPED LAWN
26	MECHANICAL ROOM (BEYOND)
27	STAIRS
28	EXISTING CONCRETE WALL
29	BOARD & BATTON
31	WOOD LOUVER
32	EXISTING BUILDING

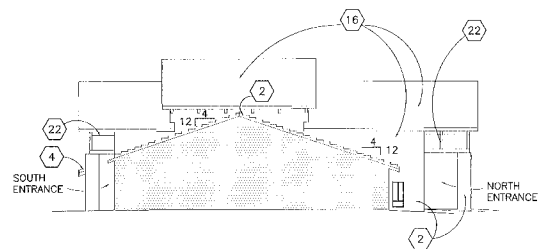
AVE. C. RM. PHASE ONE PHASE TWO PHASE THREE PHASE FOUR PHASE FIVE PHASE SIX PHASE SEVEN PHASE EIGHT PHASE NINE PHASE TEN PHASE ELEVEN PHASE TWELVE PHASE THIRTEEN PHASE FOURTEEN PHASE FIFTEEN PHASE SIXTEEN PHASE SEVENTEEN PHASE EIGHTEEN PHASE NINETEEN PHASE TWENTY PHASE TWENTY ONE PHASE TWENTY TWO PHASE TWENTY THREE PHASE TWENTY FOUR PHASE TWENTY FIVE PHASE TWENTY SIX PHASE TWENTY SEVEN PHASE TWENTY EIGHT PHASE TWENTY NINE PHASE THIRTY	DESIGNED: CAW CHECKED: BD DATE: 2002 MARCH	SUB SHEET NO. A5	TITLE OF SHEET EXTERIOR ELEVATIONS V.C. COMPLEX REHABILITATION, PHASE 1 MAMMOTH CAVE NATIONAL PARK	DRAWING NO. 80,090 SHEET 22 OF 46
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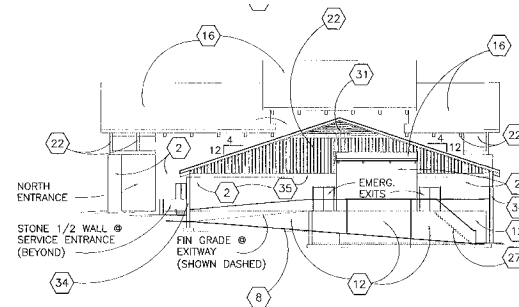
A NORTH (FRONT) ELEVATION



B SOUTH (REAR) ELEVATION



C EAST SIDE ELEVATION

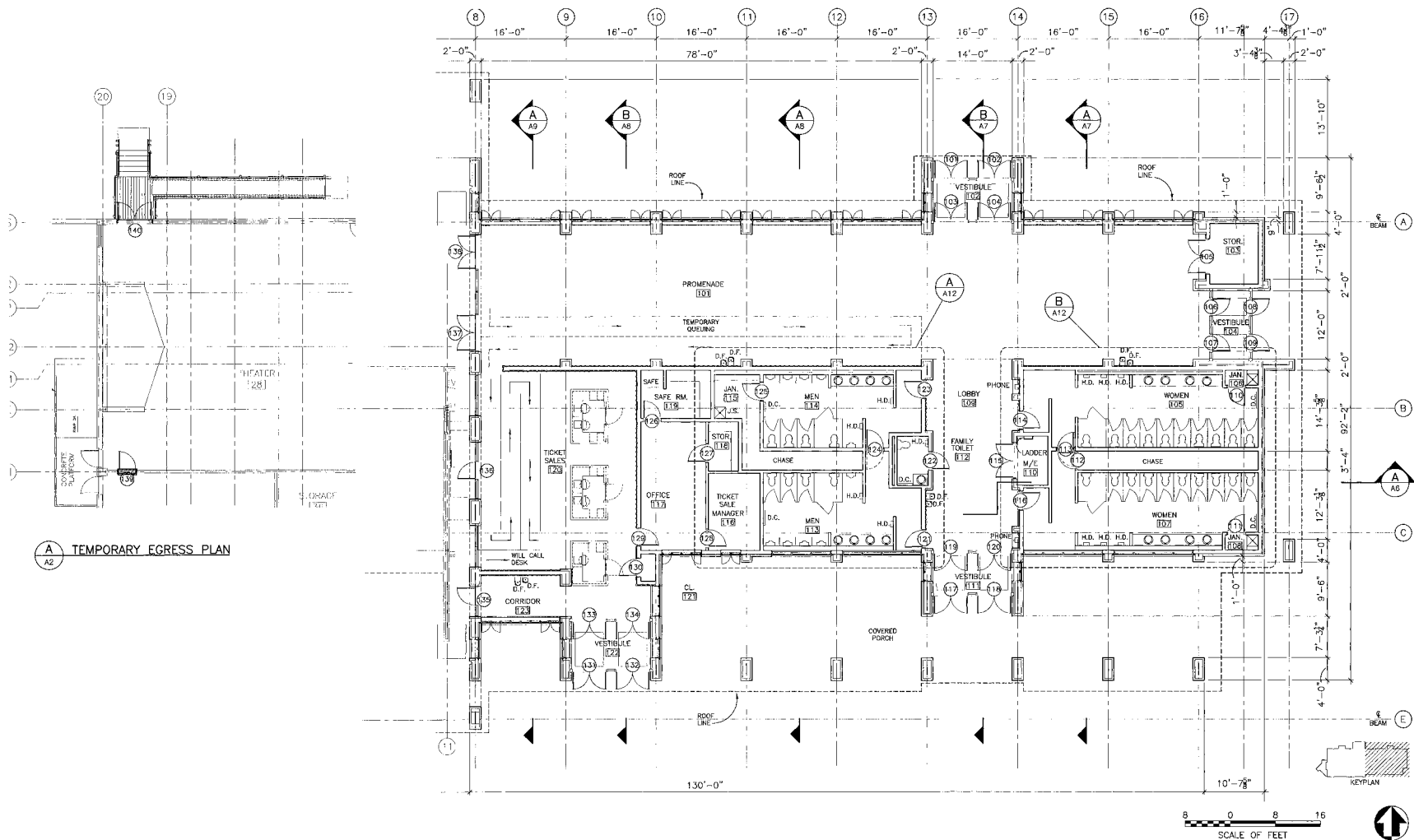


D WEST SIDE ELEVATION

NOTES	
1	REFER TO SHEET XX FOR WINDOW ELEVATIONS & DETAILS
KEYNOTES	
2	MFR STONE
4	ROOF LINE (BEYOND)
6	12" TALL MFR. STONE SOLDIER COURSE @ LITTLE BM
7	PRE-FIN ALUM. STOREFRONT ASSY.
8	FIN GRADE
9	8" MFR. STONE SOLDIER BASE CONT.
10	EXIST. BLDG (BEYOND)
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12	CONC WALL
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26	MECH. RM. (BEYOND)
27	STAIRS
28	EXISTING CONCRETE WALL
29	WOOD LOUVER
30	EXISTING BUILDING
31	CONCRETE FOUNDATION
32	STONE PIER (BEYOND)
33	WD FASCIA BOARD
34	MASONRY PIER (BEYOND)
35	2x12 FASCIA TRIM BOARD

16 0 16 32
SCALE OF FEET

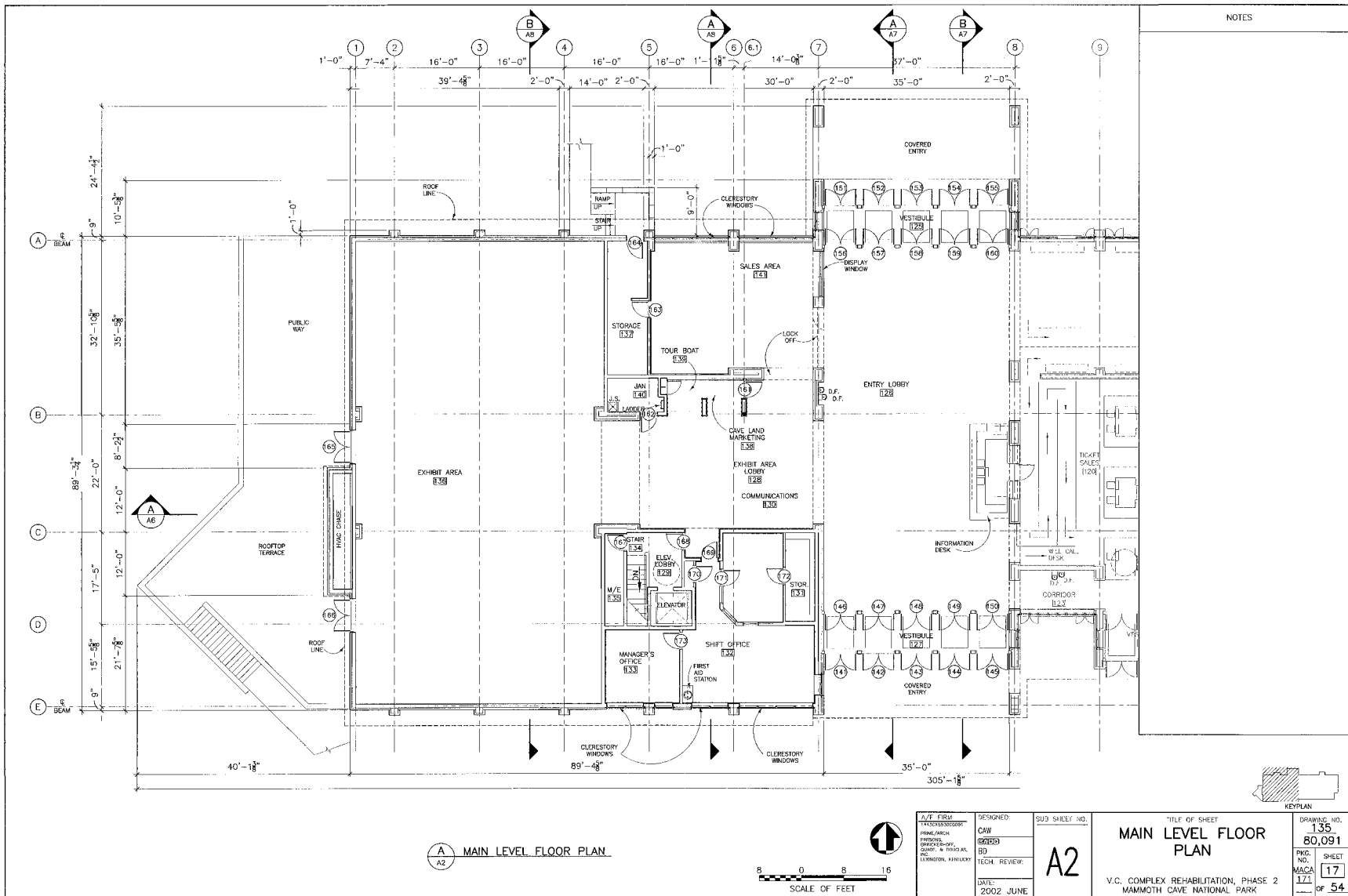
J/E FIRM TYPED SIGNATURE DATE: 2002 JUNE	DESIGNED:	SUB SHEET NO. A5	TITLE OF SHEET EXTERIOR ELEVATIONS V.C. COMPLEX REHABILITATION, PHASE 2 MAMMOTH CAVE NATIONAL PARK	DRAWING NO. 135 80,091
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A2
MAIN LEVEL FLOOR PLAN

A/C. FROM "REDESIGNING" PRINCE/ARD- VANDER- BRUNSWICK, VANDER- LINDEN, KENTUCKY	DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
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			V.C. COMPLEX REHABILITATION, PHASE 1 MAMMOTH CAVE NATIONAL PARK	19 OF 62







ALTERNATIVE 3: NO ACTION

Under the “no action” alternative the visitor services and fee collections facilities would not be renovated. Several long-standing needs would not be addressed. Visitors would continue to suffer because of crowding. Space for educational exhibits that would present the natural and cultural history of the park would not be developed. Protection of park resources would continue to suffer because of the lack of essential educational activities for park visitors.

AFFECTED ENVIRONMENT

THE PARK IN GENERAL

Mammoth Cave National Park is located in south central Kentucky, in the counties of Edmonson, Barren, and Hart. The park is within the Second Congressional District.

In establishing Mammoth Cave National Park, Congress relied heavily on the recommendations of the Southern Appalachian National Park Commission incorporating it into Senate Report No. 823 which in turn was referenced in the Act establishing the park. The Commission recommended that the park contain 70,618 acres including the extensive limestone caverns and associated topography, portions of the Green and Nolin rivers, and a substantial segment of the rugged landscape north of Green River. The Commission stated that the area containing these features offered

"exceptional opportunity for developing a great national recreational park of outstanding service in the very heart of our nation's densest population and at a time when the need is increasingly urgent and most inadequately provided for."¹⁰

Today the park encompasses 52,830 acres acquired by a combination of donations and public and private funds.

Mammoth Cave National Park contains the world's longest known cave system and offers internationally renowned examples of karst topography. Many types of cave formations are present within the extensive 360 plus mile cave system. The park is part of what is believed to be the most diverse cave ecosystem in the world. Of the more than 130 species of fauna within the cave system, fourteen species of troglobites or troglophiles are known to exist only within Mammoth Cave and other caves in the immediate vicinity. Many of these species have been isolated from other cave systems for over a million years, resulting in fragile and unique populations. One of these species is the federally endangered Kentucky Cave Shrimp Palaemonias ganteri. Water of the proper quality and quantity is essential to preserving life within the cave system.

In addition to the world renowned cave system, the park is noted for its outstanding scenic rivers, valleys, bluffs, forests, and abundant wildlife. The park includes twenty-five miles of the Green River and six miles of the Nolin River. The Green River supports a diverse freshwater mussel population including seven federal endangered species in addition to its role as the master stream controlling the geologic development of Mammoth Cave and its unique ecosystem.

On October 27, 1981, Mammoth Cave National Park was listed by the United Nations Educational Scientific and Cultural Organization (UNESCO) as a World Heritage Site and on March 27, 1990 as an International Biosphere Reserve. In April 1996, the Mammoth Cave Area Biosphere Reserve was officially extended and now includes lands within Barren, Butler, Edmonson, Hart, Metcalfe, and Warren counties in Kentucky.

¹⁰ "Final Report of the Southern Appalachian National Park Commission to the Secretary of the Interior, June 30, 1931." United States Government Printing Office. 1931, page 18.

NATURAL RESOURCES

Ecosystems

On a landscape scale, there are three functioning ecosystems in the Mammoth Cave Region including the cave ecosystem, which can be subdivided into aquatic and terrestrial components, the riverine ecosystem, which can be subdivided into sinking streams and base-level rivers, and the forest ecosystem, which is composed of several communities. Locally there are remnants of the prairie or barrens ecosystem that existed in the vicinity of the park prior to 1800.

Sinking streams and cave streams are part of the river continuum since they are tributaries of base-level rivers via springs. These distinct but connected aquatic ecosystems are energetically supported by inwashed organic debris from the forest and former barrens ecosystems. Food transport is usually down gradient, but natural backflooding from the river ecosystem through springs into the lower cave streams is also important.

The terrestrial cave ecosystem is also dependent upon the forest ecosystem for its food base. The importation of food is mostly accomplished by cave crickets, bats, and packrats which feed outside, and use caves for refuge where their guano accumulates. Relatively minor amounts of organic material enter the terrestrial cave ecosystem either as flood deposits in normally dry passages, by washing in through entrances, or carried in by raccoons that enter caves to feed and leave their scat.

The Green River, and its tributary Nolin River, flows 25 and 7 miles respectively through the park. These base-level streams possess one of the most diverse fish (82 species) and invertebrate faunas (51 species of mussels alone) in North America. An unused navigation dam (Lock and Dam 6) just beyond the downstream park boundary interrupts normal flow of 16 miles of the Green River and all of the Nolin River within the park. Habitats for eight federally listed endangered species are seriously degraded through reduction of natural flow velocity and resultant siltation. The seven mussel species that are federally endangered are effectively excluded from the Lock and Dam 6 impoundment because the impounded waters do not meet their habitat requirements.

Transitional between the Oak-Hickory Forest Region to the west, and the Mixed Mesophytic Forest Region to the east and north, Mammoth Cave National Park contains portions of each. With over 1,000 species of flowering plants, including 84 species of trees, the diversity within plant communities is high. Forest communities in the patchwork of karst terrain largely differentiate along moisture gradients governed by proximity to surface streams and ponds, which is largely determined by bedrock geology and soil structure. Physiographic factors such as slope and aspect also govern the range of moisture extremes through the seasons. Cedar Glades and Barrens naturally occur on steep dry limestone slopes that face south and southwest, and on disturbed sites. On moderately dry sites near ridgetops, Chestnut Oak and Red Maple are found. Under the mesic conditions found on lower slopes, in the bottoms of narrow karst valleys, and the relatively level terrain on top of plateau fragments, oaks, Hickories, American Beech, Tulip Poplar, and Maples sort according to local conditions. Juniper, Virginia Pine, and Blackjack Oak largely dominate former farm fields. At the wettest end of the moisture spectrum, Hemlock and Umbrella Magnolia occur in deep sandstone gorges, and on river floodplains Sycamore, Box Elder, and River Birch occur.

Most of the forest growth within the park is secondary, and very similar in size and age structure. The "Big Woods" area, however, has never been logged and contains old growth stands of white oak, black oak, tulip poplar, beech, and maple. The "Big Woods" is recognized as a State Natural Area by the Commonwealth of Kentucky and is one of the largest remaining stands of old growth forest in the state.

Endangered Species

The park is located in portions of Barren, Edmonson, and Hart Counties in Kentucky. The species considered in this document were identified by the U.S. Fish and Wildlife Service as known to occur or with the potential to occur within Mammoth Cave National Park.¹¹ Species contained in the list which have no known presence within the park are indicated by insertion of (NP) following the common name, and they are not considered in the analysis of environmental consequences.

Listed Endangered Species

Indiana Bat	<i>Myotis sodalis</i> ^{1,2}
Gray Bat	<i>Myotis grisescens</i>
Red-cockaded Woodpecker (NP)	<i>Picoides borealis</i>
Bachman's Warbler (NP)	<i>Vermivora bachmanii</i>
Kirtland's Warbler (NP)	<i>Dendroica kirtlandii</i>
Kentucky Cave Shrimp	<i>Palaemonias ganteri</i> ²
Rough Pigtoe Pearly Mussel	<i>Pleurobema plenum</i>
Clubshell	<i>Pleurobema clava</i>
Ring Pink	<i>Obovaria retusa</i>
Fanshell	<i>Cyprogenia stegaria</i>
Pink Mucket Pearly Mussel (NP)	<i>Lampsilis orbiculata</i>
Northern Riffleshell	<i>Epioblasma torulosa</i>
Orange-footed Pearly Mussel (NP)	<i>Plethobasus cooperianus</i>
Cumberlandian Combshell (NP)	<i>Epioblasma brevidens</i>
Fat Pocketbook (NP)	<i>Potamilus capax</i>
Tubercled-blossom Pearly Mussel	<i>Epioblasma torulosa torulosa</i>
Purple Cat's Paw Pearly Mussel	<i>Epioblasma torulosa sulcata</i>
Cracking Pearly Mussel (NP)	<i>Hemistena lata</i>

Listed Threatened Species

Bald Eagle	<i>Haliaeetus leucocephalus</i>
Eggert's Sunflower	<i>Helianthus eggertii</i>
Price's Potato Bean (NP)	<i>Apios priceana</i>

Proposed Species

Scaleshell (NP)	<i>Leptodea leptodon</i>
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Candidate Species

Surprising Cave Beetle	<i>Pseudanopthalmus inexpectatus</i>
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¹¹ Personal Communication, James Widlak, U.S. Fish and Wildlife Service, Kentucky-Tennessee Field Office, January 11, 2002.

¹² Critical habitat has been established within the park for these species.

Beaver Cave Beetle (NP)
 Clifton Cave Beetle (NP)
 Cumberland Johnny Darter (NP)
 Fluted Kidneyshell (NP)
 Greater Adams Cave Beetle (NP)
 Icebox Cave Beetle (NP)
 Lesser Adams Cave Beetle (NP)
 Louisville Cave Beetle (NP)
 Short's Bladderpod (NP)
 Slabside Pearlymussel (NP)
 Tatum Cave Beetle (NP)
 White Fringeless Orchid (NP)

Pseudanophthalmus major
Pseudanophthalmus caecus
Etheostoma nigrum ssp. Susanae
Ptychobranchus subtentum
Pseudanophthalmus pholeter
Pseudanophthalmus frigidus
Pseudanophthalmus cataryctos
Pseudanophthalmus troglodytes
Lesquerella globosa
Lexingtonia dolabelloides
Pseudanophthalmus parvus
Platanthera integrilabia

Hydrology

Mammoth Cave is by far the world's longest known cave system. It is the heart of the Southcentral Kentucky Karst, which is an integrated set of subterranean drainage basins covering more than 400 square miles. The surveyed extent of Mammoth Cave currently stands at over 360 miles with potential to exceed 1,000 miles. There are more than 200 other caves within the park which are disconnected fragments of the larger system or associated with local drainage features. The geology and geography of the area has resulted in a variety of karst basins, which have become the most thoroughly understood conduit-flow aquifers in the world.

The park is bisected east to west by the Green River, which defines the hydrologic base level and divides the region into two distinct physiographic areas. North of the river an alternating series of limestones and insoluble rocks are exposed with the main limestone strata accessible only near the river and in the bottom of a few deeply incised valleys. This has resulted in rugged topography with streams that alternately flow on insoluble rocks, over waterfalls, enter caves in limestone, and resurge at springs perched on the next lower stratum of insoluble rock. The caves are numerous but are relatively smaller with smaller drainage basins when compared to Mammoth Cave. South of the Green River the surface and subsurface is defined by the Mammoth Cave karst aquifer, a component of which is the Mammoth Cave System. The complex nature of the Mammoth Cave karst aquifer is demonstrated by the number of groundwater basins, sub-basins, and intricate groundwater flow routes throughout the region. By using data from groundwater traces, we are able to identify which groundwater recharge areas contribute flow into particular points of interest, wells, springs, and caves.

The Mammoth Cave karst aquifer owes the majority of its recharge to areas outside the park boundary. This recharge, in the form of precipitation or the injection of liquid wastes, enters the aquifer through numerous sinking streams and countless sinkholes. Any practices that may have an adverse impact to water quality within the recharge area of the park can directly affect the water quality of the park.

The Mammoth Cave karst aquifer exhibits convergent flow, much like the convergent flow patterns of a dendritic surface stream system. While other aquifers may possess diffuse flow, where contaminants slowly disperse, the convergent flow of the Mammoth Cave karst aquifer will channel recharge and pollutants toward a common trunk conduit or spring.

Flow through the Mammoth Cave karst aquifer can be very rapid, on the order of 1,000's to 10,000's of feet per day. Contaminants entering the karst aquifer can thus be rapidly transported

unaltered through the conduit system. The karst aquifer is very dynamic, that is, it responds nearly instantaneously to rainfall. Aquifer stage can rise 10's of feet in a matter of hours (there are numerous records showing stage rises of over 100 feet over the course of one day). In addition, chemical and bacteriological properties of the groundwater can change dramatically following rainfall events. These stage rises can activate high-level overflow routes between groundwater basins and thus direct flow in different directions depending upon aquifer conditions.

Because large portions of the upper Green River watershed and the groundwater basins affecting Mammoth Cave National park lie outside park boundaries, activities conducted in these areas greatly influence water quality within the park. The primary activities that influence the park's water quality include: disposal of domestic, municipal, and industrial sewage; solid waste disposal; agricultural and forestry management practices; oil and gas exploration and production, urban land-use; and recreational activities.

Air Quality

Mammoth Cave National Park is a Class I area under the Clean Air Act. Based on data collected from 1991-1999, Mammoth Cave National Park ranks as the third most polluted National Park in the United States. The measures used in developing the ranking were visibility, ozone, and acid precipitation.¹³

Mammoth Cave NP currently monitors ozone, sulfur dioxide (SO₂), carbon monoxide (CO), nitric oxide (NO), total reacted nitrogen (NO_y), particulate matter (PM_{2.5} and PM₁₀), visibility (aerosol and optical), wet deposition, and volatile organic compounds (VOC). The EPA designated Edmonson County, Kentucky, as a non-attainment area for ozone in 1990 after recording six violations of the 1-hour ozone National Ambient Air Quality Standard (NAAQS) from 1987 to 1989. Edmonson County, Kentucky, was re-designated as attaining the ozone NAAQS in 1995, following six years of measurements below the ozone NAAQS. The worst air quality days typically occur in winter because of low boundary layer conditions, and summer due to stagnant air masses.

Soils

Of the eleven soil orders recognized, three are dominant in Mammoth Cave National Park. Most parent material is locally derived with minor influence from loess deposited during the last glaciation. On limestone substrates, Alfisols have developed which have a high base supply due to the underlying carbonate rock. Acid soil conditions still develop due to leaching of cations by rainwater, the natural production of carbon dioxide from biological activity, and weathering of aluminum from clay. However, calcium is replenished via root uptake, transfer to leaf litter, and ultimate deposition in soil via decomposition. On sandstone, shale, and conglomerate strata, Ultisols characterized by a low base supply have developed. The parent material derived from these clastic strata lack the calcium and magnesium ions of the carbonate associated soils, and therefore very acid soil conditions develop. Both the Alfisols and Ultisols have well-formed horizons unlike the Inceptisols developed largely on younger alluvium near streams. Because of the mixed sources of alluvial material, soil acidity varies greatly from site to site, and vertically through a profile.

¹³ Polluted Parks in Peril: The Five Most Air Polluted National Parks in the United States. Compiled by Harvard G. Ayers, Appalachian State University. Boone, North Carolina. October 2000, p. 1.

Some sites, such as sandstone cliff margins dominated by pines, and steep limestone cedar-oak glades have a patchwork of exposed bedrock and thin soil. In karst valleys, soil cover over bedrock varies from absent to tens of feet over short distances due to soil piping, epikarst development, and accumulation of colluvium in sinkholes.

CULTURAL RESOURCES

The cultural time line for the park covers 10,000 years of human history and extends prehistorically from the Paleo-Indian Period to the Middle Mississippian Period. The historic period begins with Early Settlement 1774-1825, and continues through the Depression Era 1929-1941. Representing these periods are 1,112 archeological sites (prehistoric and/or historic), and 28 historic structures on the surface and in the cave. Most of the structures and some sites have been evaluated for their National Register eligibility and of those evaluated, eligible structures and sites have been listed.

The War of 1812 Saltpeter Works in Mammoth Cave are considered the park's most significant historic structures. Remains include leaching vats, a pump tower base, and an extensive water pipe system made out of hollowed logs. Other important historic structures include stone tuberculin huts (circa 1842), steam engine number four and coach (circa 1900), and Civilian Conservation Corps structures (circa 1937). Few structures remain from the period before establishment of the park. These structures include three churches (circa 1900) and the Floyd Collins House and Ticket Office (circa 1926).

One of the more significant archeological sites is the Salts Cave Vestibule. The study of this and other cave sites has convinced scientists that park caves and rock shelters were extensively utilized by prehistoric people from the Late Archaic through the Early Woodland Periods. The cave environment has preserved materials that would otherwise quickly decompose in above ground areas. Textile samples and the remains of foodstuffs have provided important information about the life-ways of these early peoples.

NON-HISTORIC BUILDINGS AND FACILITIES

The majority of buildings and other facilities in the park are non-historic. Included are utility systems, the Visitor Center, Hotel, the Great Onyx Job Corps Center, warehouse, and most storage sheds and garages. Most utilities are underground and within road corridors. In cooperation with the Kentucky State Historic Preservation Office, all park structures have been evaluated using the National Register Criteria. Determinations of eligibility and ineligibility are complete and eligible structures are listed on the National Register of Historic Places. Ineligible structures are listed in Appendix B of the Mammoth Cave National Park Programmatic Agreement, which has been mutually agreed to by the park, the Kentucky State Historic Preservation Office, and the Advisory Council On Historic Preservation. Under conditions of the Programmatic Agreement, the eligibility and ineligibility listings are reviewed every five years. The most recent review was completed in August 2001. The Visitor Center, Mammoth Cave Hotel, Gift Shop, and Restaurant have been evaluated and are not considered eligible for the National Register, even under the National Park Service guidance regarding Mission 66 structures.

AFFECTED ENVIRONMENT

SPECIFIC LOCATIONS AFFECTED BY THIS PROPOSAL

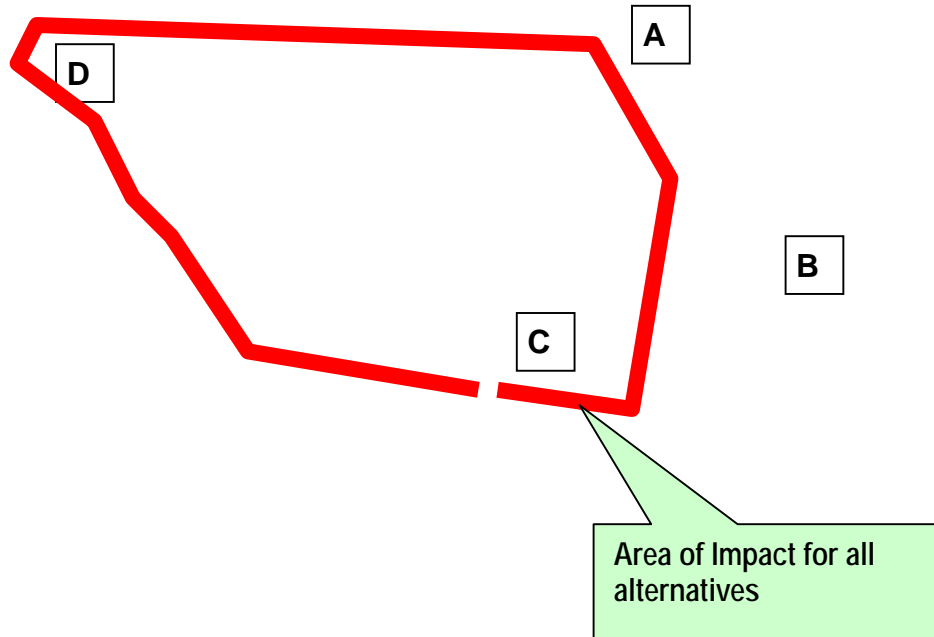
Description of the Visitor Center Site

The aerial photo shown below was taken in March 1990, and shows the extent of development in the park headquarters area. This area is designated in the General Management Plan as the Headquarters Area Subzone of the Park Development Zone. It has been highly modified to serve the needs of visitors and park management and is the most highly developed location in the park.¹⁴



The project area is delineated in the blow up of the aerial photograph on the next page. All alternatives considered would affect the same area. The entire project area has been previously disturbed during construction of the existing visitor facilities.

¹⁴ GMP, October 1983, 40.



View of Project Area

The following ground level photographs were taken on July 17, 2001. They are included to illustrate the character of the landscape within the project area. Virtually all trees in the project area are plantings. Many were added in the 1980's.



**View of Visitor Center from “A” on
Project View Above**



**View of East Building and Proposed Bus
Staging Area From “B” on Project View**

The lawn area located east of the current visitor center was used extensively from the 1960's through the mid-1980's for overflow parking. Much of the area was paved at that time with gravel for temporary roads and parking spaces.



**View of Proposed Tour Staging Area
From “C” on the Project View**



**View of West Building and Existing Bus
Staging Area From “D” on the Project
View**

The visitor center facility consists of two structures connected by a covered breezeway. From the breezeway, a concrete footbridge, over the ravine leading to the historic cave entrance, connects the visitor center facility with the hotel facility. The west building houses visitor services, including information, ticket sales, and related office and storage space. The east building is presently used for administration offices.

SITE DESCRIPTION

The current visitor facilities are located on a relatively level ridgetop at the head of a ravine leading to the Green River. This location is the northwestern end of the Mammoth Cave Ridge. The original forests were cleared in the late 1700's and early 1800's. The site was used before establishment of the park in 1941 for farms, gardens, and residences. There were water lines and above ground electric and telephone service. During construction of the existing developments, the site was further disturbed. Following establishment of the park, areas around the developed site began to recover. These adjacent areas are now covered with second growth forest.

Wetlands and Floodplains

There are no wetlands within or near the project area. The site is located on the top of the Mammoth Cave Ridge approximately 300 feet in elevation above the nearest floodplain.

Vegetation

Vegetation on the project site is maintained turf grass lawns with a few trees that were planted for shade.

Threatened and Endangered Species

There are no known federally protected species present within the project area. The Kentucky Cave Shrimp is located nearby within Mammoth Cave. Drainage from the project area can be presumed to reach at least some portion of the cave that may contain the cave shrimp. Six species of endangered mussels are known to be present in the Green River. Indiana and Gray bats are present in the park and would be expected to forage in the project area. Both bat species hibernate in nearby caves. The Indiana bat would also be expected to roost in trees in or near the

project area. Eggert's Sunflower (federally threatened) is present within the park but not in the project area. The Bald Eagle (federally threatened) is present in the park at least seasonally, but is usually seen in or near the river valleys and has not been seen in the project area. A federal candidate species, the Surprising Cave Beetle, is found in a cave about one half mile from the project area.

Air Quality

Mammoth Cave National Park is a Class I area under the Clean Air Act. Based on data collected from 1991-1999, Mammoth Cave National Park ranks as the third most polluted National Park in the United States. The measures used in developing the ranking were visibility, ozone, and acid precipitation.¹⁵ The park has recently initiated monitoring for mercury. Monitoring is not conducted within the project area.

Soils/Geology

Soils in the project area are disturbed. Some amount of fill is present throughout the entire project site. The fill is largely clay. The site is underlain by layers of Big Clifty Sandstone which protect the limestone strata and caves that have developed underneath it from direct penetration of stormwater runoff. Ephemeral streams carry runoff to the ridgetops where it sinks into the underlying limestone.

Water Quality and Hydrology

The site is located at the downstream end of the Echo River groundwater basin. This location limits the potential for impacts to the cave in comparison to alternative locations further upstream. The ridge is capped with layers of Big Clifty sandstone, which serve to protect the caves underneath from surface water infiltration. This situation creates a perched water table on top of the sandstone from which water moves to the edges of the hillsides where it resurfaces for short distances before sinking into the underlying cavernous limestone.

Site hydrology has been impacted by construction of buildings and parking lots. The primary impact is the concentration of stormwater runoff into a few outfall points. A separate project (construction package 187) is expected to begin construction in 2003, which would mitigate the effects of pollutants contained in the stormwater runoff from the parking areas in developed zones. An environmental assessment for package 187 was completed and a Finding of No Significant Impact (FONSI) was issued in October 2000.

Fish & Wildlife

The most commonly seen wildlife in the project area is deer, squirrels, and common bird species.

Migratory Birds

A number of migratory birds pass through the park seasonally. None of the federally threatened or endangered species of migratory birds is known to be present in or to migrate through the park or the project area.

¹⁵ Polluted Parks in Peril: The Five Most Air Polluted National Parks in the United States. Compiled by Harvard G. Ayers, Appalachian State University. Boone, North Carolina. October 2000, p. 1.

Cultural Resources

The visitor center facility was constructed during the Mission 66 era. The park consulted with the Kentucky Heritage Council, State Historic Preservation Officer concerning the potential significance of the structures. The State Historic Preservation Officer determined that the facilities are not eligible for the National Register of Historic Places.¹⁶

Archeological surveys have found significant prehistoric sites near the project location. Archeological reconnaissance performed in relation to other projects in recent years within the project area indicates that there are no archeological sites in the project area.

Visitor Use

The Visitor Center is the primary visitor use site in the park. All cave tours originate and end at this location. Approximately two million people visit the park annually, and 425,000 take cave tours.

Land Use

The site is designated as a development zone in the park General Management Plan (1983). The General Management Plan states that facilities will be retained at this location rather than relocated.

Transportation

The site does not serve as a transportation corridor between population centers. It is a destination.

Social and Economic

Mammoth Cave National Park has been a major tourist attraction in Kentucky for over 190 years. The park generates a significant contribution to the economy of gateway communities, and is important on a statewide level.

Energy Requirements & Conservation

The current buildings are not very energy efficient. Improved insulation and mechanical systems are needed.

Public Safety

Conflicting uses in front of the Visitor Center are a public safety threat. Vehicles and pedestrians cross behind the buses that are used to transport visitors to remote cave entrances. The current building lacks security systems and barriers to potential terrorist activities.

Public Health

The buildings have suffered from poor indoor air quality due to inadequate mechanical systems.

Indian Trust Resources

There are no Indian Trust Resources or information about Indian Trust Resources in the park.

¹⁶ Morgan, David L. State Historic Preservation Officer. Letter to Superintendent, Mammoth Cave National Park, RE: Visitor Center and Pavilion, September 27, 1999, and Letter to Superintendent, May 7, 2002.

ENVIRONMENTAL CONSEQUENCES

The primary purpose of this project is to provide needed improvements in visitor service facilities. Early in the process of analyzing alternatives, the option to locate new facilities on another site was rejected for two primary reasons. First, there would be greater environmental effects associated with construction on a new site including the need to rebuild or provide new roads, parking, and utilities. Second, the cost of a new site would be much greater. Restricting the project alternative to the current disturbed site essentially limits the effects to temporary construction disturbance. The project would have to be phased to provide for continuance of cave tours and other essential visitor services during the construction period.

Following is a table that summarizes the probable impacts of the alternatives related to the relevant resources or resource values that may be affected by the proposed project. The need for mitigating actions, if any, is identified for each resource value. Following the table is a narrative discussion of the effects of the proposal related to each resource or resource value.

Impacts or potential impacts have at least three important attributes: context (i.e., location in space and time), duration, and intensity or severity. In the following discussion, the terms impact, effect, and environmental consequences are used interchangeably. Impacts are direct, indirect, and/or cumulative. Impacts can be adverse or beneficial. The duration of impacts is defined as temporary (less than two years), short-term (two to five years), long-term (five to twenty years), and permanent (more than twenty years). The intensity of impacts is described using the following threshold terms: negligible, minor, moderate, major, impairment. The following descriptions of the thresholds are for natural resource issues. Analogous relative threshold factors are employed for the other issues. Negligible impacts are so minute that they have no observable effect, and parameter measurements are well within the natural range of variability. Minor impacts are detectable, parameter measurements are within the natural range of variability, but are not expected to have any long-term effects. Moderate impacts are detectable, parameter measurements are outside the natural range of variability for short periods, and changes may be long-term. Major impacts are detectable, parameter measurements are outside the natural range of variability for short to long periods, and changes may be long-term to permanent. Impairment occurs when major impacts occur which have significant and usually permanent effects on park resources or values as defined in Section 1.4 of the National Park Service Management Policies 2001 (December 2000, p. 11-13).

Impact Summary Table

RESOURCE OR IMPACT CATEGORY	Alternative 1 RENOVATION	Alternative 2 RENOVATION PLUS	Alternative 3 NO ACTION
WETLANDS and FLOODPLAINS– Impacts would occur if wetlands are dredged or filled. This project is located on the top of the Mammoth Cave Ridge where wetlands are generally aquifers perched on top of the underlying Big Clifty sandstone. There are no wet lands within the project area. The project area is not in or near any floodplain area.			
Description of Attributes	No wetlands or floodplains	No wetlands or floodplains	No wetlands or floodplains
Type of Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect
Mitigating Actions Needed: None			

VEGETATION – The vegetation within the project area is part of a non-historic managed landscape. Trees were planted for shade and visual screening.			
Description of Attributes	Trees would be removed and replaced under new landscape plan	Trees would be removed and replaced under new landscape plan	No Change
Type of Effect	Direct	Direct	No Effect
Severity	Negligible	Negligible	No Effect
Duration	Permanent	Permanent	No Effect
Mitigating Actions Needed: Replace trees with new trees as part of the new landscape plan. All tree removal should conform to the park “Hazard Tree Management Plan,” approved June 20, 2000. The plan specifies actions necessary to avoid unintentional or incidental taking of Indiana bats.			

THREATENED AND ENDANGERED SPECIES – Indiana and Gray bats likely forage in the project area, and Indiana bats may roost in trees in the project area. The Bald Eagle is seldom seen in the park and the project area. The project construction area is within a groundwater basin that contains the Kentucky Cave Shrimp. Given that this is a heavily visited site with human activity and noise every day, the impact of additional noise or disturbance is expected to be minimal except during periods of demolition, which will be relatively short.			
Description of Attributes	Construction noise and runoff entering cave system	Construction noise and runoff entering cave system	No Effect
Type of Effect	Direct and Indirect	Direct and Indirect	No Effect
Severity	Negligible	Negligible	No Effect
Duration	Temporary	Temporary	No Effect
Mitigating Actions Needed: All tree removal activities should conform to the park “Hazard Tree Management Plan” (approved June 20, 2000). Ensure adequate erosion control plan is in place and followed.			

RESOURCE OR IMPACT CATEGORY	Alternative 1 RENOVATION	Alternative 2 RENOVATION PLUS	Alternative 3 NO ACTION
AIR QUALITY – Some amount of dust and particulates would be produced by construction during dry weather.			
Description of Attributes	Dust and fine particulates from construction	Dust and fine particulates from construction	No Dust or particles from construction
Type of Effect	Indirect	Indirect	No Effect
Severity	Negligible	Negligible	No Effect
Duration	Short-term	Short-term	No Effect
Mitigating Actions Needed: Dust should be controlled if it becomes an issue during construction.			

SOILS / GEOLOGY – The primary issues are ground disturbance and erosion prevention during construction. Based on previous construction and geo-technical investigations, rock excavation, if any, would be minimal. The effect of any ground disturbance is permanent. All construction and ground disturbance proposed by this project is within existing development zones with previously disturbed soils. Site would be regraded, hard surface walks, and plazas installed, and landscape materials installed.			
Description of Attributes	Regrading of site	Regrading of site	No Regrading
Type of Effect	Direct	Direct	No Effect
Severity	Negligible	Negligible	No Effect
Duration	Permanent	Permanent	No Effect
Mitigating Actions Needed: None			

WATER QUALITY AND HYDROLOGY – Stormwater runoff during construction could, if not mitigated, result in erosion and sedimentation.			
Description of Attributes	Erosion and downstream sedimentation	Erosion and downstream sedimentation	No construction
Type of Effect	Direct and Indirect	Direct and Indirect	No Effect
Severity	Negligible	Negligible	No Effect
Duration	Temporary	Temporary	No Effect
Mitigating Actions Needed: Control stormwater runoff during construction to prevent erosion and downstream sedimentation. The Contractor will be required to obtain construction stormwater discharge permits as required by federal and state law.			

RESOURCE OR IMPACT CATEGORY	Alternative 1 RENOVATION	Alternative 2 RENOVATION PLUS	Alternative 3 NO ACTION
FISH & WILDLIFE (other than threatened or endangered species) – Effects are primarily from noise and other disturbances during the period of construction. Because this is a heavily used visitor services area, the additional noise, except for the brief demolition periods, would be minimal.			
Description of Attributes	Construction noise and disturbance	Construction noise and disturbance	No construction
Type of Effect	Direct and Indirect	Direct and Indirect	No Effect
Severity	Negligible	Negligible	No Effect
Duration	Temporary	Temporary	No Effect
Mitigating Actions Needed: None			

MIGRATORY BIRDS – Effects are noise and disturbance during the period of construction. The threatened or endangered migratory bird species are not known to be present or to migrate through the park. Construction would be in a heavily used visitor services area where the level of activity or disturbance is relatively high on a daily basis.			
Description of Attributes	Construction noise and disturbance	Construction noise and disturbance	No construction
Type of Effect	Direct and Indirect	Direct and Indirect	No Effect
Severity	Negligible	Negligible	No Effect
Duration	Temporary	Temporary	No Effect
Mitigating Actions Needed: None			

CULTURAL RESOURCES – There are no cultural resources within the construction area. The site has been previously disturbed. Archeological testing for previous projects has demonstrated the presence of fill material and the absence of intact cultural materials or features. A National Register archeological site is nearby, and it is important to prevent expansion of the construction area. The Kentucky State Historic Preservation Officer has reviewed the existing Visitor Center, and it has been determined ineligible for the National Register even as a Mission 66 Visitor Center.			
Description of Attributes	No Cultural Resources Present	No Cultural Resources Present	No Construction
Type of Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect
Mitigating Actions Needed: Avoid expansion of the construction area.			

RESOURCE OR IMPACT CATEGORY	Alternative 1 RENOVATION	Alternative 2 RENOVATION PLUS	Alternative 3 NO ACTION
VISITOR USE – Construction work will be visible to visitors. Park enabling legislation contains specific mandate to continue cave tours and provide outdoor recreation. The project is phased to allow continuation of cave tours and existing visitor services during the period of construction.			
Description of Attributes	Construction will be visible with elevated noise levels during demolition. Facilities would be improved.	Construction will be visible with elevated noise levels during demolition. Facilities would be improved.	No Construction No improvement in facilities
Type of Effect	Direct and Indirect	Direct and Indirect	Direct and Indirect
Severity	Construction – Negligible Facilities improvements – Major beneficial	Construction – Negligible Facilities improvements – Major beneficial	No construction effects Lack of Facilities Improvement – Major Negative
Duration	Construction effects - Short-Term Facilities improvement-- Permanent	Construction effects - Short-Term Facilities improvement-- Permanent	No construction effects Lack of Facilities Improvement – Major Negative
Mitigating Actions Needed: None			

LAND USE – The project will be completed within the existing designated development zone identified in the Park General Management Plan (October 1983). The proposal would not require any changes in land use or land use designations.			
Description of Attributes	Designated development zone	Designated development zone	Designated development zone
Type of Effect	No Effect	No Effect	No Effect
Severity	No Effect	No Effect	No Effect
Duration	No Effect	No Effect	No Effect
Mitigating Actions Needed: None. No changes in land use designation are required or needed.			

TRANSPORTATION – Construction activities may periodically require traffic control for safety.			
Description of Attributes	Traffic control for safe entry and exit of vehicles	Traffic control for safe entry and exit of vehicles	No construction traffic
Type of Effect	Direct	Direct	No Effect
Severity	Negligible	Negligible	No Effect
Duration	Temporary	Temporary	No Effect
Mitigating Actions Needed: Insure the contractor performs as specified to maintain traffic flow.			

RESOURCE OR IMPACT CATEGORY	Alternative 1 RENOVATION	Alternative 2 RENOVATION PLUS	Alternative 3 NO ACTION
SOCIAL AND ECONOMIC – The primary effects are the construction funds that would be paid to the contractor.			
Description of Attributes	Construction dollars effect on economy	Construction dollars effect on economy	No Construction
Type of Effect	Indirect	Indirect	No Effect
Severity	Negligible	Negligible	No Effect
Duration	Short-term	Short-term	No Effect
Mitigating Actions Needed: None			

ENERGY REQUIREMENTS & CONSERVATION – A mandatory facet of design of National Park Service building projects is required certification under the Leadership in Energy & Environmental Design (LEED) program administered by the U.S. Green Building Council. Each action alternative would result in significant energy savings and other conservation measures including use of sustainable materials from nearby sources, etc. Although one building does not significantly reduce energy consumption, this building will provide a visible example and demonstration of what conservation measures are possible with existing technologies.			
Description of Attributes	LEED Certification unlikely – too many doors, lacks daylighting, etc.	LEED Certification	No Effect
Type of Effect	Direct and Indirect	Direct and Indirect	No Effect
Severity	Negligible beneficial	Minor beneficial	No Effect
Duration	Permanent	Permanent	No Effect
Mitigating Actions Needed: None			

PUBLIC HEALTH – The primary issue with the existing building has been “sick building” syndrome caused in part by deficiencies in the HVAC systems, which were largely corrected in 2001. Each of the alternatives would include systems that would provide good indoor air quality.			
Description of Attributes	Improved indoor air quality	Improved indoor air quality	No Effect
Type of Effect	Indirect	Indirect	No Effect
Severity	Minor-beneficial	Minor-beneficial	No Effect
Duration	Permanent	Permanent	No Effect
Mitigating Actions Needed: None			

RESOURCE OR IMPACT CATEGORY	Alternative 1 RENOVATION	Alternative 2 RENOVATION PLUS	Alternative 3 NO ACTION
PUBLIC SAFETY – There are safety issues with the current tour staging. Specifically, pedestrian and vehicle traffic cross the path of concessions tour buses. Each of the action alternatives would relocate the tour staging. Each action would incorporate additional security and safety measures including homeland security improvements.			
Description of Attributes	Tour Staging Relocated	Tour Staging Relocated	Tour Staging Not Relocated
Type of Effect	Indirect	Indirect	Indirect
Severity	Minor - Beneficial	Minor - Beneficial	Minor - Adverse
Duration	Permanent	Permanent	Permanent
Mitigating Actions Needed: The tour staging needs to be relocated to eliminate safety issues with conflicting traffic.			

INDIAN TRUST RESOURCES - There are no Indian Trust Resources in the park, and the park does not have or retain any records or other information of Indian Trust resources.			
Description of Attributes	Not Applicable	Not Applicable	Not Applicable
Type of Effect	Not Applicable	Not Applicable	Not Applicable
Severity	Not Applicable	Not Applicable	Not Applicable
Duration	Not Applicable	Not Applicable	Not Applicable
Mitigating Actions Needed: None			

RISK OF UNANTICIPATED CONSEQUENCES – The effect on visitation could be greater than expected. The level of visitation is not expected to be affected by construction; however, visitation could be lower or higher than anticipated. General economic conditions throughout the country have more influence on travel than local construction conditions. Because the site has been previously disturbed, the risk of unanticipated environmental effects is minimal.			
Description of Attributes	No change in visitation	No change in visitation	No change in visitation
Type of Effect	No Effect	No Effect	No Effect
Severity	N/A	N/A	N/A
Duration	N/A	N/A	N/A
Mitigating Actions Needed: None			

RESOURCE OR IMPACT CATEGORY	Alternative 1 RENOVATION	Alternative 2 RENOVATION PLUS	Alternative 3 NO ACTION
CUMULATIVE IMPACTS – Cumulative impacts include other actions governmental and private that can reasonably be predicted to occur as a result of implementation of each alternative. Retention of facilities at the current site limits the potential for cumulative impacts. A different site would require new roads, utilities, and other infrastructure improvements.			
Description of Attributes	No cumulative impacts expected	No cumulative impacts expected	No cumulative impacts expected
Type of Effect	No Effect	No Effect	No Effect
Severity	N/A	N/A	N/A
Duration	N/A	N/A	N/A
Mitigating Actions Needed: None			

ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

The following discussion summarizes the likely effects of the alternatives for each resource or resource value evaluated in this environmental assessment. Cumulative effects and impairment are also discussed for each resource category. Cumulative effects are the additional actions by any entity that can reasonably be predicted to occur as a result of the proposed action. The meaning of impairment is spelled out in the National Park Service (NPS) Organic Act of 1916 (16 USC 1); the NPS General Authorities Act of 1970, including amendments in 1978 (16 USC 1a-1); and the NPS Management Policies 2001 (Section 1.4). Impairment means impact(s)

“that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.”¹⁷

The effects of the three action alternatives on most resources or resource values are similar, if not identical, because each alternative requires a comparable level of construction on the same site. In the following discussion of the environmental consequences, they are referred to collectively as the proposal. In cases where there is a discernable difference in the effects of the action alternatives, they are identified separately.

WETLANDS AND FLOODPLAINS

There are no wetlands or floodplains in the project area. Therefore, the proposal is not expected to effect wetlands or floodplains.

The no action alternative would not effect wetlands or floodplains.

Impairment. The proposal would not impair wetlands or floodplains.

Cumulative Effects. There are no cumulative effects on wetlands or floodplains.

VEGETATION

Site vegetation consists primarily of turf grass lawns with some trees for shade and screening. Approximately thirty-five trees would be removed during construction. These trees would be replaced with new plantings of native shade trees.

The no action alternative would not effect vegetation.

Impairment. The proposal would not impair vegetation or natural processes.

Cumulative Effects. There are no cumulative effects on vegetation because of the proposal.

THREATENED AND ENDANGERED SPECIES

Indiana and Gray bats (endangered) are likely to forage in the project area, and Indiana bats may roost in trees in the project area from April 1 through November 15 annually. The potential

¹⁷ National Park Service Management Policies 2001, Section 1.4.5. December 2000, p. 12.

effects from construction include tree removal, noise, and other direct disturbance of the bats. The park has developed a Hazard Tree and Vegetation Management Plan in consultation with the U.S. Fish and Wildlife Service that specifies conditions for removal of trees to prevent the inadvertent taking of Indiana bats.¹⁸ The proposal is not likely to adversely effect Indiana or Gray bats.

The Bald Eagle (threatened) has a transient presence in the park, but is seldom seen in the project area. No effects are expected related to the Bald Eagle.

The site is within the Echo River groundwater basin that contains the Kentucky Cave Shrimp (endangered). The potential effects are related to runoff from the construction areas. Adequate controls are needed to prevent erosion and sedimentation as well as to capture any spills of hazardous materials. It is expected that, in addition to standard erosion control methods, stormwater runoff treatment facilities will be installed early in the construction period, which will further reduce the chances of sediments or hazardous materials entering the groundwater from the site. No adverse effects are expected related to the Kentucky Cave Shrimp.

The proposal does not include any areas near the Green River, which provides habitat for seven species of endangered mussels. The proposal is not likely to effect endangered mussels.

The Surprising Cave Beetle (candidate for federal endangered status) is located in a cave approximately 0.5 miles from the construction site. The proposal is not likely to effect the Surprising Cave Beetle.

The proposal is not likely to adversely effect threatened and endangered species.

The no action alternative would not effect threatened and endangered species.

Impairment. The proposal would not impair threatened and endangered species.

Cumulative Effects. The proposal would not produce cumulative effects related to threatened and endangered species.

AIR QUALITY

The primary effects would be dust and fine particulates produced by construction activities in dry weather. Controls are required to prevent production of excessive amounts of dust. The effects are expected to be negligible and temporary.

The no action alternative would not effect air quality.

Impairment. The proposal would not impair air quality.

Cumulative Effects. There are no cumulative effects on air quality because of the proposal.

SOILS AND GEOLOGY

The primary issues are ground disturbance and erosion prevention during construction. Appropriate erosion and sedimentation control measures will be in place at all times. The effects on geology and soils within the areas of reconstruction are negligible but permanent.

The no action alternative would have no effect on soils and geology.

¹⁸ See Mammoth Cave National Park Standard Operating Procedures Handbook, Section H. Chapter 1. See also Mammoth Cave National Park Impact Assessment file IA-0003, "Revise Hazard Tree and Vegetation Management Plan."

Impairment. The proposal would not impair soils and geology.

Cumulative Effects. There are no cumulative effects on soils and geology.

WATER QUALITY AND HYDROLOGY

Stormwater runoff during construction could, if not properly mitigated, result in erosion and sedimentation. The effects are expected to be temporary and negligible.

The no action alternative would have no effect on water quality and hydrology.

Impairment. The proposal would not impair water quality and hydrology.

Cumulative Effects. There would be no cumulative effects related to water quality and hydrology.

FISH AND WILDLIFE (OTHER THAN THREATENED OR ENDANGERED SPECIES)

The effects are similar to the effects on threatened or endangered species. However, abundant species would be present near the construction areas and would frequently be exposed to the disturbance and noise associated with construction. The effects are expected to be negligible and temporary.

The no action alternative is not expected to effect fish and wildlife.

Impairment. The proposal would not impair fish and wildlife.

Cumulative Effects. There would be no cumulative effects on fish and wildlife.

MIGRATORY BIRDS

The effects on migratory birds are primarily noise and other physical disturbance. No threatened and endangered migratory bird species are known to be present or to migrate through the park. Construction is expected to produce temporary negligible effects on migratory birds.

The no action alternative is not expected to effect migratory birds.

Impairment. The proposal would not impair migratory birds.

Cumulative Effects. There would be no cumulative effects on migratory birds.

CULTURAL RESOURCES

Archeological survey of the project area will be completed before beginning of construction. Surveys have been conducted throughout the project area related to previous projects. The Kentucky State Historic Preservation Officer has reviewed the Visitor Center and nearby related structures for National Register eligibility, and has determined that the structures are not eligible even as Mission 66 era developments.

The no action alternative is not expected to effect cultural resources.

Impairment. The proposal would not impair cultural resources.

Cumulative Effects. There would be no cumulative effects on cultural resources.

VISITOR USE

Construction work would be visible to visitors. The project is phased to allow cave tours and other visitor services to continue with minimal disruption. The effects on visitation would be mitigated by use of all available media to keep visitors informed. The construction effects related to visitor use would be negligible and short-term. The improvement in facilities that would result from the proposal would be expected to produce major beneficial effects on visitor use that would be permanent.

The no action alternative would not produce any improvement in visitor facilities. The negative effects on visitor use from the current inadequate facilities would continue indefinitely.

Impairment. The proposal would not impair visitor use.

Cumulative Effects. There would be no cumulative effects related to visitor use.

LAND USE

The proposal would be completed within areas previously designated as development zones in the park General Management Plan (October 1983). The proposal would not require any changes in land use or land use designations. No effects are expected.

The no action alternative would not effect land use or land use designations.

Impairment. The proposal would not impair land use.

Cumulative Effects. The proposal would have no cumulative effects related to land use.

TRANSPORTATION

The site is located at the end of the road. The site does not involve transportation between population centers. The site is the hub for cave tours. Short-term negligible effects on traffic in the immediate vicinity of the Visitor Center are anticipated.

The no action alternative is expected to have no effect on transportation.

Impairment. The proposal would not impair transportation.

Cumulative Effects. There would be no cumulative effects on transportation.

SOCIAL AND ECONOMIC

The primary social and economic issue is the construction funds that would be paid to the contractor. These funds would then enter the economy in a variety of ways. The effects are expected to be negligible and short-term.

The no action alternative would be expected to have no effect on social or economic values.

Impairment. The proposal would not impair social and economic values.

Cumulative Effects. There would be no cumulative social or economic effects.

ENERGY REQUIREMENTS AND CONSERVATION

The proposal would greatly improve energy efficiency when compared to the existing facilities. The new Visitor Center would be certified by the U.S. Green Building Council using the Leadership in Energy and Environmental Design (LEED) rating system. The proposal would

result in permanent minor beneficial effects. Alternative 1 would not provide the desired improvement in energy efficiency, and probably could not attain LEED certification.

The no action alternative would not improve the situation related to energy requirements and conservation.

Impairment. There would be no impairment related to energy requirements and conservation.

Cumulative Effects. There would be no cumulative effects related to energy requirements and conservation.

PUBLIC HEALTH

The proposal would have a beneficial effect on indoor air quality by providing improved mechanical systems.

The no action alternative would be unlikely to effect public health.

Impairment. There would be no impairment of public health.

Cumulative Effects. There would be no cumulative effects related to public health.

PUBLIC SAFETY

The tour staging areas would be consolidated and the bus access to the staging area would not cross routes used by other vehicles and pedestrians. The benefits of relocating the tour staging area would be minor but permanent. The renovated or new Visitor Center would incorporate security and safety measures that would address a number of threats including homeland security needs.

The no action alternative would have no effect because it would do nothing to alleviate the current threats to public safety.

Impairment. There would be no impairment of public safety.

Cumulative Effects. There would be no cumulative effects related to public safety.

INDIAN TRUST RESOURCES

There are no Indian Trust resources in the park, and the park does not have or retain any records or other information related to Indian Trust resources. There would be no effect on Indian Trust resources.

The no action alternative would have no effect on Indian Trust Resources.

Impairment. There would be no impairment of Indian Trust resources.

Cumulative Effects. There would be no cumulative effects related to Indian Trust resources.

RISK OF UNANTICIPATED CONSEQUENCES

Adequate contract supervision and project inspection to insure the work remains on schedule would mitigate the risk. A variety of media would be used to keep visitors apprised of the construction status. Because this project would renovate existing facilities within the limits of the existing disturbed site, the risk of unanticipated consequences is limited.

The no action alternative would have no new risk of unanticipated consequences. The existing inadequate facilities would remain in place until they are replaced by a future project.

Impairment. There would be no impairment associated with the risk of unanticipated consequences.

Cumulative Effects. There are no reasonably discernable cumulative effects related to unanticipated consequences.

CUMULATIVE IMPACTS

Cumulative impacts include other actions governmental and private that can reasonably be predicted to occur as a result of the proposal. No cumulative effects have been identified related to this proposal.

The no action alternative would likely result in a series of smaller rehabilitation projects for building components as they deteriorate to the point that they can not be maintained in usable condition without major rehabilitation. The overall capacity of the building would not be increased and its functionality would not be improved.

Impairment. There would be no impairment of park resources related to the cumulative effects.

SUMMARY OF MITIGATING ACTIONS

The following list restates the mitigating actions identified in the preceding discussion of the likely environmental consequences of the proposal. These are the important conditions that should be utilized to limit the potential for unexpected adverse consequences.

- All tree removal activities should conform to the park “Hazard Tree Management Plan” (approved June 20, 2000). The park completed formal consultation with the U.S. Fish and Wildlife Service before approval of the plan. The primary issue is protection of Indiana bats. Any trees to be removed should be removed when Indiana bats are hibernating in caves (November 15th to March 31st) and therefore are unlikely to be roosting in trees. Approximately 35 landscape trees are expected to be removed. These trees would be replaced with new plantings.
- Dust should be controlled if it becomes an issue during construction.
- Erosion and sedimentation control measures should be in place to prevent movement of soils from the site into the cave system.
- Effective construction management and supervision should be provided to insure that public safety and other concerns related to construction are properly addressed.

CONSULTATION AND COORDINATION

Kentucky State Clearinghouse in the Kentucky Natural Resources and Environmental Protection Cabinet (The clearinghouse distributed copies to the following Kentucky State Agencies.):

Division of Water
Division of Waste Management
Division for Air Quality
Department of Health Services
Economic Development Cabinet
Division of Forestry
Department of Surface Mining Reclamation and Enforcement
Department of Parks
Department of Agriculture
Nature Preserves Commission
Kentucky Heritage Council
Division of Conservation
Department for Natural Resources
Department of Fish and Wildlife Resources
Transportation Cabinet, Department for Military Affairs

U.S. Fish and Wildlife Service, Field Office in Cookeville, Tennessee

U.S. Department of Energy, Oak Ridge, Tennessee

PUBLIC INVOLVEMENT

The Draft Environmental Assessment was available for public review and comment for a period of thirty days ending on December 6, 2002. A press release was issued announcing the availability of the draft document for public review. The document was posted on the park Internet site. Hard copies were available on request.

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ATTACHMENTS

1. U.S. Geologic Survey Topographic Map (7.5 minute)
2. Section 7, Endangered Species Act Compliance Documentation
3. Section 106, National Historic Preservation Act Section 106 Compliance Documentation
4. Other Agency Comments and Response
5. Public Comments and Response

REFERENCES

- National Park Service Management Policies 2001. December 2000.
- U.S. Department of the Interior, National Park Service, Denver Service Center. General Management Plan: Mammoth Cave National Park. Denver, October 1983.
- U.S. Department of the Interior, National Park Service. Director's Order #12, Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making. January 2001.
- U.S. Department of the Interior. "Final Report of the Southern Appalachian National Park Commission to the Secretary of the Interior, June 30, 1931." United States Government Printing Office. 1931.
- U.S. Department of the Interior, National Park Service, Mammoth Cave National Park. Mammoth Cave National Park Strategic Plan, 2001-2005. April 2000.
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